Section A

INTRODUCTION TO GOVERNMENT-FUNDED PROJECTS

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INTRODUCTION AND BACKGROUND TO THRIP AND THE INNOVATION FUND

The National Skills Development Strategy (NSDS) and the National Human Resource Development Strategy have been developed to overcome South Africa's rating as one of the poorest human resource development records in the world. Underpinning these national strategies is an acknowledgement of the failure of education and training in South Africa to be responsive to the changing needs of the economy and industry's interest to ensure adequate human resource development at an enterprise level. The need to bridge the gaps between the worlds of education and work has found articulation in legislation[4] passed with the aim of 'overcoming the structural rigidities and inequalities inherited from the apartheid era to meet the dual challenges of social development and the requirements to compete in the global economy' (Department of Labour 2001).

This need to bridge the historical divide between the worlds of education and research and the worlds of work is clearly articulated in the mission and strategy adopted by THRIP and the Innovation Fund. Both THRIP and the Innovation Fund aim to incentivise technological advancement through the establishment of partnerships and/or collaborative endeavours, which seek to ensure multi-institutional and multi-sectoral cross-transference of technological knowledge for the purposes of advancing SET research, SET human resource capacity and the technology outputs of research, in South Africa.

As will be discussed below, THRIP projects are specifically structured as either HE-industry or SETI-industry partnerships, thereby ensuring a cross-transference of knowledge, skills and resources, including human resources across academic institutions, government SET institutions and the industrial sector. Embedded in the THRIP project structure is the need to ensure that research outputs and project outputs can be commercialised for the purposes of achieving the organisations' overarching goals, i.e., to improve the competitiveness of South African industry in the context of globalisation and technological advancement. THRIP's emphasis on the need for HE/SET-industry partnerships to achieve these goals is evidenced in its commitment to

[4] This legislation includes the National Skills Development Strategy, The Skills Development Act, Skills Levies Act, The Employment Equity Act and other education-related acts such as the FET Act and the SAQA Act.

fund R1:R1 in instances where more than one industry partner is involved in any project and where the second highest industry contribution is at least ten per cent of the highest industry contribution. Clearly, the vision that THRIP aims to achieve through partnerships is a network society in which the resources available across institutions are brought together for the technological and human resource enhancement of the enterprises themselves and the nation as a whole.

Innovation Fund projects, on the other hand, are structured to 'encourage and enable longer-term transdisciplinary innovation projects in the higher education sector, government science councils, civil society and the private sector', once again with the purpose of ensuing economic growth, international competitiveness and human resource development in the fields of science and technology. The Innovation Fund places considerable emphasis on ensuring that research projects culminate in tangible technological advances and reserves the right to withdraw ownership of intellectual property from any funded project consortium, should it be determined that the results of the project have not been economically exploited. This indicates a strong commitment to ensuring that knowledge does not become isolated from national human resource and SET objectives.

However, despite the fact that both programmes, either as a direct part of their mission or as an indirect result thereof promote higher education-industry linkages, there are significant differences between them. This section, by providing an overview of the central thrust of both THRIP and the Innovation Fund, highlights the different missions and aims for each of these programmes and the way in which they propose to enable higher education-industry partnerships.

3.1 THE TECHNOLOGY AND HUMAN RESOURCES FOR INDUSTRY PROGRAMME (THRIP)

The Technology and Human Resources for Industry Programme (THRIP) is a programme managed by the National Research Foundation (NRF) for the Department of Trade and Industry (DTI), that aims to 'improve the competitiveness of South African industry by supporting scientific research, technology development and technology diffusion activities and enhancing the quality and quantity of appropriately skilled people' (DTI THRIP, *Guide to Research Support* 1998). The programme has been designed to foster collaboration among industry, higher education institutions (HEIs) and the government science, engineering and technology institutions (SETIs) as a means of 'contributing to the removal of past inhibitions to joint activity among these three sectors'. THRIP aims to achieve its mission by supplying grants that match contributions made by industry to project activities that qualify for THRIP support. The grant funds are provided by the DTI.

The primary objectives of the programme are to:

- Increase the number and quality of people with appropriate skills for the development and management of technology for industry;

- Promote increased interaction among researchers and technology managers in industry, higher education and government science, engineering and technology institutions (SETIs), with the aim of developing skills for the commercial exploitation of science and technology. This should promote the mobility of trained people among these sectors;
- Stimulate industry and government to increase their investment in research, technology development, technology diffusion and the promotion of innovation.

THRIP has also highlighted a number of priorities in relation to the objectives outlined above, which include:

- Supporting an increase in the number and quality of black and female graduates who intend to pursue technological and engineering careers;
- Promoting technological know-how within the small, medium and micro enterprise (SMME) sector, through the deployment of skills vested in HE institutions and SETIs;
- Facilitating and supporting multi-firm projects in which firms collaborate and share in the project outcomes.

THRIP requires that projects meet three main criteria to be eligible for consideration, which are linked to its mission statement. These are:

1. Projects must promote and facilitate scientific research, technology development, and technology diffusion, or any combinations of these;
2. All projects funded by THRIP must include a human resource development component;
3. The choice of technological focus for the activities is to be left to the industrial participants and their partners.

There are three primary mechanisms through which THRIP funds projects. These are outlined, as follows, in the THRIP *Guide to Research Support* (DTI, 1998).

1. Projects led by a researcher or researchers based at higher education institutions: In such cases, industry and THRIP invest jointly in research projects, where the research leaders are academic staff of HE institutions. Such projects ensure that industrial and academic research priorities are aligned and that students are able to develop the appropriate skills for participation in the industrial sector.
2. Participation of government SETIs in THRIP projects: The second mechanism aims at mobilising the skills base in science, engineering and technology (SET) disciplines within government SETIs in South Africa so as to contribute to bridging the existing gap between higher education institutions and SETIs. This is done through collaborative research involving SETIs, higher education

institutions and industry, in relation to industrial research priorities. This mechanism is further divided into two scenarios:

a. SETI-based expertise contracted in by higher education-based researchers: Where one or more SETI-based expert(s) collaborate on a contract basis with a HE-based researcher or research teams on THRIP projects. THRIP provides financial support through the HE institution.

b. SETI-based researcher constitutes the project leader: THRIP also supports projects where SETI-based researchers serve as project leaders.

THRIP requires that each SETI involves at least one historically black university (HBU) or technikon in one out of every three projects supported by THRIP. It is stated that this could 'significantly contribute towards building research capacity in South Africa's historically disadvantaged HE institutions'.

3. TIPTOP options: The Technology Innovation Promotion through the Transfer of People (TIPTOP) option is a set of placement mechanisms designed to promote the mobility of people participating in THRIP projects amongst the organisations involved (HEIs, SETIs and industry). There are various options in the TIPTOP mechanism.

a. Exchange of researchers and technology managers between HEIs, SETIs and industry: In terms of this option, THRIP provides support for academic researchers at HE institutions to enable them to work in industrial laboratories. THRIP also encourages and supports industrial researchers and technology managers to be temporarily seconded to HEIs or SETIs to conduct research that is of direct relevance to the industry involved.

b. Placement of SET graduates in industry, while they are working towards a higher degree on a joint research project: This option supports the placement of graduates in SET-related disciplines within industry on a contract basis to work on THRIP-approved projects. The graduate should be registered at an HE institution for a higher degree in SET. The graduate is mentored both by their academic supervisor and superiors in industry. This support is for a maximum of two years for a masters degree and three years for a doctoral degree.

c. Placement of SET graduates in SMMEs: This option involves the placement of SET graduates in SMMEs for fixed periods to work on THRIP projects.

d. Placement of SET-skilled company employees within HEIs or SETIs: This option supports the secondment of graduate employees from industry to HE institutions or SETIs to do research for THRIP projects while studying towards a higher degree. THRIP contributes 70% of the cost where the employee is either black or female, so as to stimulate growth in the number of highly skilled blacks and women in the research workforce.

The criteria for THRIP support include the following:

- The project must be a high quality science, engineering and/or technology research project, the outputs of which can potentially make a significant contribution to improving the industry partner's competitive edge;
- At least one registered student must be involved in and trained through the research; this excludes the placement of SET graduates in SMMEs;
- The project must have clearly defined scientific and/or technology outputs plus human resource outputs for each year of support;
- The project leader must have full-time employment status at the HE institution or SETI;
- At least one HE institution and one industry partner must be involved;
- The industry partner must give a clear indication that the project will directly support the specific company;
- Commitment from the industry partner must be clearly shown in terms of investment in the project; and
- Arrangement for ownership and exploitation of intellectual property arising from the project must be agreed upon between the HEI/SETI and the industry partner before commencing the project.

In terms of funding, THRIP support is limited to South African HEIs and SETIs. The various funding formulae are as follows:

- R1 for R2: In this formula, THRIP contributes a maximum of R1 for every R2 invested by industry in a project that satisfies THRIP criteria.
- R1 for R1: According to this formula, THRIP will fund R1 for every R1 invested by industry when at least one of the following conditions apply:
    - Projects involve at least five students, of whom at least half are black or female;
    - Projects where SMMEs (one or more) invest financially; and
    - Projects in which more than one industrial partner contributes and the second highest industry contribution is at least 10% of the highest industry contribution.
- SETI-based expertise contracted in: Where SETI-based expertise is contracted into a project with an HE institution as the project leader, THRIP's contribution to this component will be limited to a maximum of 30% of the total THRIP contribution to the project.
- TIPTOP funding options: THRIP contributes 50% (up to a maximum of R100 000 per person on an annual basis) of the costs and the firm will pay the balance. Where placement involves SMMEs and black or female participants,

THRIP will pay 70% (up to a maximum of R140 000 per person on an annual basis) of the costs and the participating firm pays the balance. The TIPTOP funding is independent of whether or not the overall project qualifies for the R1:R2 or R1:R1 options.

Due to an increasing demand for THRIP funds, an element of prioritisation needed to be introduced in assessing applications for funding. THRIP's budget grew, as evidenced in Table 1, exponentially from 1995 to 2000. THRIP began applying a Multi-Criteria Decision Model (MCDM) to assess project proposals for funding. Beyond the minimum requirements for consideration, fundable projects are also subjected to a process of ranking in terms of MCDM criteria.

It is important to note that THRIP funds a wide variety of technological projects, the focus of which is at the discretion of the grant holders (HEIs and SETIs) and the industry partners. While all THRIP projects funded in 2001 and 2002 are included in this study, the focus is on the three critical technology fields, i.e. biotechnology, ICT and new materials development.

Table 1: THRIP expenditure 1995–2000

Year	THRIP expenditure R '000	Allocation of THRIP budget	Number of projects	Technikons	Universities	SETIs
1995/96	5 598	50.60%	78	10	68	-
1996/97	24 086	83.10%	173	9	164	-
1997/98	46 872	99.20%	399	30	366	3
1998/99	71 200	94.60%	405	33	347	25
1999/00	96 500	98.40%	384	39	325	20
2000/01	137 500	98.20%	413	49	331	33

3.2 THE INNOVATION FUND

The Innovation Fund provides grants to fund end-stage research processes, where research knowledge can be translated into 'new and improved products, processes or services'. The Innovation Fund aims to achieve the following overall objectives:

- Improve and sustain the quality of life for all South Africans;
- Develop human resources for science and technology;
- Strengthen the country's competitiveness in the international sphere; and
- Foster economic growth.

The Innovation Fund started within the Department of Arts, Culture, Science and Technology (DACST) for a trial period in the 1997/1998 financial year. The focal area for this initial trial period was crime prevention. In 1998/1999 the Fund began to operate as a full-blown programme, designed to support large-scale science,

engineering and technology (SET) innovation programmes. The key objectives of the Innovation Fund are to:

- Promote technological innovation within the research community;
- Permit the reallocation of funds from the historical patterns of government science towards the key issues of competitiveness, quality of life, environmental sustainability and harnessing information technology;
- Increase the extent to which funds for the activities of government SETIs are obtained via competitive processes; and
- Promote transdisciplinary collaboration across sectors within South Africa.

A brief introduction to the Innovation Fund was provided during an interview with Dr Lottering, Director of the Innovation Fund. He included the following objectives, in addition to the above:

- Encourage and enable longer-term, large innovation projects in the higher education sector, government science councils, civil society and the private sector;
- Promote increased networking and cross-sectoral collaboration within South Africa's national innovation system;
- Encourage close relationships between those conducting the research activities and those who will be expected to diffuse and make practical use of the results;
- Facilitate the financing of problem-oriented research involving participants from many disciplines.

The Innovation Fund is currently funding projects in the fields of biotechnology, new materials development and advanced manufacturing, ICT and Flora and Fauna.[5] According to the Innovation Fund, 'the nature of the problems/challenges addressed by this Fund should be serious enough to impede socio-economic development or affect our ability to compete in products and services. The projects must therefore involve technological innovation with a large component being research and development'. It is also specified that there 'must be some indication of benefits extending beyond those accruing to a particular organisation/business'.

The evaluation criteria for proposals submitted to the Innovation Fund include the following:

- Criteria relating to national benefit: Project proposals are required to give a clear indication of how South Africa stands to benefit from the proposed project in terms of improved efficiency, increased employment, new capital investment, exports, and import replacements;
- Criteria relating to innovation: A clear illustration must be given of the innovative nature of the projects;

[5] The methodology chapter contains further discussion on the technological fields.

- Criteria relating to technical details: Details are required on the methodology for developing technological innovation up to prototype stage and a research and development plan is required;
- Criteria relating to project potential for utilisation of results/commercialisation: Each proposal must include a strategy for commercialisation or utilisation of results.

The Innovation Fund has been set up to support large collaborative projects as a strategy for achieving enhanced technological innovation in South Africa. The minimum threshold for funding a project is R1 million per year and the maximum threshold is R5 million per year. So, while the programme does not directly aim to develop higher education-industry partnerships, there is the potential for such to be supported through the aims and mission of the Innovation Fund. In fact, a review of the project partnerships (provided later) shows that more SETIs than higher education institutions are accessing funding from the Innovation Fund.

Intellectual property generated by any project consortium is vested in the consortium and all parties are required to sign a legally binding Consortium Intellectual Property Agreement at the proposal stage of any project. The Innovation Fund Trust reserves the right to claim ownership of the Intellectual Property Rights if, after five years, it is determined that no attempt has been made to exploit the results of the project supported by public funds.

3.3 CONCLUSION

While both THRIP and the Innovation Fund incentivise higher education-industry partnerships, THRIP does so as a direct aspect of their mission and strategy while, for the Innovation Fund, such partnerships are a by-product of their strategy to encourage innovation. This is highlighted in later chapters that show that the majority of the partners involved in THRIP projects are higher education institutions as compared to the Innovation Fund, where the majority of the partners are SETIs rather than HEIs. In addition, the Innovation Fund targets larger projects with a minimum threshold of R1 million per year, while THRIP does not set a minimum project threshold.

Despite differences in mission and approach between the two programmes, both programmes have made a contribution to enabling higher education and industry linkages (as later chapters will indicate). While recognising the differences in mission and approach between the THRIP and the Innovation Fund, this study has examined collectively (and separately) the extent and nature of the contribution that these programmes have made to enabling higher education-industry linkages.